

What is Claimed is:

1. A self-refresh device, comprising:

a partial array self-refresh decoder for decoding and
5 latching an address preset as an extended mode register set
code in response to a mode register set signal, and then
selectively activating a plurality of control signals for
performing a partial array self-refresh operation by
combining corresponding addresses when a self-refresh
10 signal is activated; and

a row address strobe generator for controlling a row
active signal for selectively activating at least one or
more banks depending on states of the plurality of control
signals when a refresh operation signal is activated, or
15 selectively activating a certain array region selected in a
single bank.

2. The device according to claim 1, further
comprising:

20 a command decoder for outputting the mode register
set signal, the self-refresh signal and a refresh flag
signal by decoding an externally inputted refresh command;

a refresh counter for outputting a refresh request
signal by performing a counting operation corresponding to

a refresh cycle in response to the refresh flag signal;
an internal address counter for counting and
generating an internal address in response to the refresh
flag signal and the refresh request signal; and
5 a row pre-decoder for outputting an external address
as a row address in a normal mode, and outputting the
internal address as the row address in a refresh mode.

3. The device according to claim 1, wherein the
10 extended mode register set sets up a code for performing a
self-refresh operation on a cell array corresponding to a
half of one bank when a partial array self-refresh
operation is in a half of bank mode, and for performing a
self-refresh operation on a cell array corresponding to a
15 quarter of one bank when a partial array self-refresh
operation is in a quarter of bank mode.

4. The device according to claim 3, wherein when
the partial array self-refresh operation is in a HALF of
20 BANK mode, the partial array self-refresh decoder activates
control signals corresponding to a quarter of the plurality
of control signals until a most significant bit of address
in the bank becomes high.

5. The device according to claim 3, wherein when
the partial array self-refresh operation is in a quarter of
bank mode, the partial array self-refresh decoder activates
control signals corresponding to a quarter of the plurality
5 of control signals until at least one of two most
significant bits of address in the bank becomes high.

6. The device according to claim 1, wherein the
partial array self-refresh decoder comprises:

10 an extended mode register set decoder for outputting
a register set control signal by decoding a bank selection
address in response to the mode register set signal;

a plurality of address latches each of which for
outputting register set address bit by latching a address,
15 in response to the register set control signal and the
self-refresh signal when the mode register set signal is
applied; and

20 a partial array self-refresh controller for
selectively activating the plurality of control signals by
decoding the plurality of register set addresses depending
on input of the internal address.

7. The device according to claim 6, wherein the
extended mode register set decoder activates the register

set control signal at the activation of the mode register set signal when a most significant bit address of the bank selection address is high, and a second most significant bit of the bank selection address is low.

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8. The device according to claim 7, wherein the extended mode register set decoder comprises:

a first inverter for inverting the second most significant bit of the bank selection address;

10 a first NAND gate for NANDing the most significant bit of the bank selection address and an output signal of the first inverter;

a second inverter for inverting an output signal of the first NAND gate; and

15 a second NAND gate for outputting the register set control signal by NANDing the mode register set signal and an output signal of the second inverter.

9. The device according to claim 6, wherein one of the plurality of address latches comprises:

a first switch for selectively outputting one of the plurality of addresses in response to the mode register set signal;

a first latch for latching an output signal of the

first switch;
a second switch for selectively outputting an output signal of the first latch in response to the register set control signal;

5 a second latch for latching an output signal of the second switch; and

a first logic unit for outputting an output signal of the second latch as one of the plurality of register set addresses in activation of the self-refresh signal.

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10. The device according to claim 9, wherein the first latch and the second latch, respectively, comprise a third inverter and a fourth inverter where each output signal is feedback as an input signal.

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11. The device according to claim 9, wherein the first logic unit comprises:

a third NAND gate for NANDing the self-refresh signal and an output signal of the second latch; and

20 a seventh inverter for inverting an output signal of the third NAND gate.

12. The device according to claim 6, wherein the partial array self-refresh controller outputs first, second

and third control signals obtained by decoding the plurality of register set addresses and the plurality of inverted register set addresses, and

the first control signal is selectively outputted in
5 response to the internal address.

13. The device according to claim 12, wherein the first control signal is outputted when a most and a second most significant bits of the internal address are both
10 high, or when one of the most and the second most significant bits of the bank selection address is high.

14. The device according to claim 1, wherein the row address strobe generator controls the row active signal
15 depending on a bank selection address and a normal operation signal activated in a normal mode, and controls the row active signal depending on the plurality of control signals and the refresh operation signal activated in a refresh mode.

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15. The device according to claim 14, wherein the row address strobe generator comprises:

a first switching means for being selectively turned on in response to the normal operation signal and the

refresh operation signal;
a second switching means for being turned on depending on activation of the bank selection address when the normal operation signal is activated, and then
5 activating the row active signal; and

a third switching means for being turned on depending on activation of the plurality of control signals when the refresh operation signal corresponding to a refresh request signal is activated, and then activating the row active
10 signal.

16. The device according to claim 15, wherein the first switching means comprises a first PMOS transistor and a second PMOS transistor connected in series between a power source terminal and the second switching means, the first PMOS transistor and the second PMOS transistor having each gate to receive the normal operation signal and the refresh operation signal, respectively.
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20 17. The device according to claim 15, wherein the second switching means comprises a first NMOS transistor and a second NMOS transistor connected between the first switching means and a ground terminal, the first NMOS transistor and the second NMOS transistor having gates to

receive the normal operation signal and the bank selection address, respectively.

18. The device according to claim 15, wherein the
5 third switching means comprises a third NMOS transistor and
a fourth NMOS transistor connected between the first
switching means and a ground terminal, the third NMOS
transistor and the fourth NMOS transistor having gates to
receive the refresh operation signal and the plurality of
10 control signals.

19. The device according to claim 1, wherein the
row address strobe generator is comprised to have the same
number of the banks.

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20. A self-refresh method, where refresh modes are
classified, into a plurality of modes including a HALF of
BANK mode for refreshing a half of one bank and a QUARTER
of BANK mode for refreshing a quarter of one bank,
20 depending on extended mode register set codes,

the method comprising the step of performing a
partial self-refresh operation to an array region where
data is stored, by performing one of the plurality of
self-refresh modes depending on the extended mode register

set codes.